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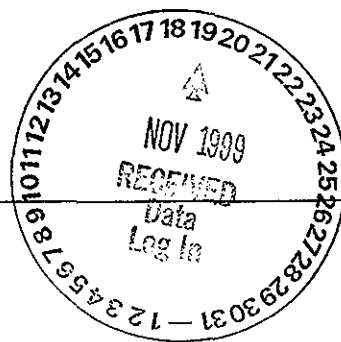
## CERTIFICATE OF ANALYSIS

Bechtel Hanford, Inc.  
3350 George Washington Way  
Richland, WA 99352

November 16, 1999

Attention: Joan Kessner

SAF Number : B99-024  
Date SDG Closed : September 9, 1999  
Number of Samples : Five (5)  
Sample Type : Other (Solid)  
SDG Number : W02883  
Data Deliverable : Summary



### I. Introduction

On August 26, 1999, five solid (matrix: other) samples were received at the Quanterra Richland Laboratory (QRL) for radiochemical analysis. Upon receipt, the samples were assigned the following laboratory ID numbers to correspond with the Bechtel Hanford, Inc. (BHI) specific IDs:

<u>QESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
9D1RVG10	B0W517	OTHER	8/26/99
9D1RVV10	B0W518	OTHER	8/26/99
9D1RW010	B0W515	OTHER	8/26/99
9D1RW310	B0W516	OTHER	8/26/99
9D1RW810	B0W519	OTHER	8/26/99

### II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analyses were:

#### Gas Proportional Counting

Gross Alpha by method RICH-RC-5014

Gross Beta by method RICH-RC-5014

#### Alpha Spectroscopy

Plutonium-238, -239/40 by method RICH-RC-5010

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Americium-241 by method RICH-RC-5080  
Curium-244 by method RICH-RC-5080  
Neptunium-237 by method RICH-RC-5009  
**Gamma Spectroscopy**  
Gamma Scan by method RICH-RC-5017

### III. Quality Control

The analytical results for each analysis performed under SDG W02883 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate sample analysis. Any exceptions have been noted in the "Comments" section.

QC and sample results are reported in the same units.

### IV. Comments

#### **Gas Proportional Counting**

##### Gross Alpha by method RICH-RC-5014:

The LCS, batch blank, samples and sample duplicate (B0W519) results are within contractual requirements.

##### Gross Beta by method RICH-RC-5014:

The LCS, batch blank, samples and sample duplicate (B0W515) results are within contractual requirements.

#### **Alpha Spectroscopy**

##### Plutonium-238, -239/40 by method RICH-RC-5010:

The batch blank result is greater than the CRDL. The cause is unknown; possible contamination from sample B0W518. The batch was reanalyzed with exception of sample B0W516. This sample was analyzed in duplicate and had insufficient volume remaining for reanalysis. The MDAs for the sample and duplicate results do not meet the CRDL due to a reduced volume analyzed based on the original result for this sample. The detected activity exceeds the achieved MDA, therefore the results are accepted. The elevated activity in sample B0W518 exceeded the tracer level added and a recovery could not be determined. The sample was reanalyzed using a reduced volume. The MDA for the reanalysis does not meet the CRDL, however, the detected activity exceeds the MDA achieved. The data are accepted for reporting. Except as noted (for the reanalysis batch), the LCS, batch blank, sample and sample duplicate results are within contractual requirements.

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Americium-241 by method RICH-RC-5080:

The elevated activity in sample B0W518 exceeded the tracer level added and a recovery could not be determined. The sample was reanalyzed using a reduced volume. The MDA for the reanalysis does not meet the CRDL, however, the detected activity exceeds the MDA achieved. The data are accepted for reporting. Except as noted, the LCS, batch blank, sample and sample duplicate (B0W516) results are within contractual requirements.

Curium-244 by method RICH-RC-5080:

The MDA for sample B0W518 does not meet the CRDL due to sample matrix; a reduced aliquot was used for analysis based on the initial failed americium analysis. The detected activities for the plutonium and americium isotopes justify the reduced aliquot analyzed, therefore the data is accepted for reporting. Except as noted, the LCS, batch blank, sample and sample duplicate (B0W516) results are within contractual requirements.

Neptunium-237 by method RICH-RC-5009:

The sample matrix spike result failed to meet acceptance limits with a 22% radiochemical recovery due to sample matrix. The data are accepted for reporting with approval [J. Kessner 10/21/99]. The duplicate sample results have detected activity greater than the achieved MDA. These results may be false positive due to elevated levels of plutonium found in the sample. Except as noted, the LCS, batch blank, samples, sample duplicate (B0W518) and sample matrix spike (B0W516) results are within contractual requirements.

**Gamma Spectroscopy**

Gamma Scan by method RICH-RC-5017:

The MDAs do not consistently meet the CRDL for all isotopes reported for samples B0W515, B0W516, B0W517, B0W518 and B0W519 due to insufficient volumes (insulation and metal coupon matrices). Standard count times were used with the reduced gamma geometries. Two batch method blank samples were analyzed at comparable sample geometries (based on sample volumes). The blank with the smaller/reduced (25mL) geometry did not meet the CRDL for any isotope except Cs-137. The blank with the standard volume (200mL) geometry was within limits for all isotopes, therefore the data are accepted with the MDAs achieved. Duplicate analysis results for Cs-137 do not meet the RPD limit due to the non-homogeneous sample matrix (insulation). Since all other isotopes are within limits, the duplicate results are accepted for reporting. Except as noted, the LCS, batch blank, samples and sample duplicate (B0W517) results are within contractual requirements.

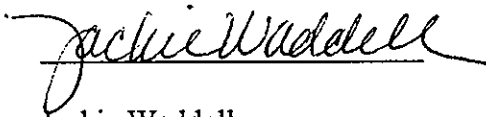
I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this

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hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:

A handwritten signature in cursive script, reading "Jackie Waddell", written over a horizontal line.

Jackie Waddell  
Project Manager

## SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: 9D1RVG10 MATRIX: OTHER  
CLIENT ID: B0W517 DATE RECEIVED: 8/26/99 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
CO-60	2.67E-02	U	5.2E-02	5.2E-02	9.35E-02	pCi/g		RICHRC5017
CS-137	2.62E-01		8.1E-02	8.1E-02	8.64E-02	pCi/g		RICHRC5017
EU-152	-1.24E-01	U	1.4E-01	1.4E-01	2.21E-01	pCi/g		RICHRC5017
EU-154	-3.42E-02	U	1.5E-01	1.5E-01	2.54E-01	pCi/g		RICHRC5017
EU-155	1.53E-02	U	1.2E-01	1.2E-01	2.02E-01	pCi/g		RICHRC5017
ALPHA	4.91E+01		4.6E+00	1.1E+01	1.51E+00	pCi/g	100.00%	RICHRC5014
BETA	1.11E+01	J	2.1E+00	2.6E+00	3.01E+00	pCi/g	100.00%	RICHRC5014

Number of Results: 7

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result <

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rptChemRadSample; v3.41

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**SAMPLE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: 9D1RVV10 MATRIX: OTHER  
CLIENT ID: B0W518 DATE RECEIVED: 8/26/99 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
NP-237	1.98E+00		1.8E-01	4.9E-01	1.13E-02	pCi/g	100.00%	RICHRC5009
CO-60	2.02E-02	U	5.2E-02	5.2E-02	9.72E-02	pCi/g		RICHRC5017
CS-137	1.57E-01		9.1E-02	9.1E-02	8.08E-02	pCi/g		RICHRC5017
EU-152	9.12E-02	U	1.3E-01	1.3E-01	2.32E-01	pCi/g		RICHRC5017
EU-154	3.18E-02	U	1.5E-01	1.5E-01	2.69E-01	pCi/g		RICHRC5017
EU-155	1.05E-01	U	1.0E-01	1.0E-01	1.56E-01	pCi/g		RICHRC5017
ALPHA	1.40E+03		1.3E+01	2.9E+02	3.42E-01	pCi/g	100.00%	RICHRC5014
BETA	2.54E+01		1.1E+00	3.5E+00	6.03E-01	pCi/g	100.00%	RICHRC5014

Number of Results:

# SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: 9D1RVV20 MATRIX: OTHER  
CLIENT ID: B0W518 DATE RECEIVED: 8/26/99 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
AM-241	3.74E+02		3.7E+01	7.4E+01	4.16E+00	pCi/g	91.32%	RICHRC5008
CM-242	1.22E+00	U	2.4E+00	2.4E+00	3.30E+00	pCi/g	91.50%	RICHRC5008
CM-244	0.00E+00	U	0.0E+00	2.2E+00	2.48E+00	pCi/g	91.50%	RICHRC5008
PU-238	5.99E+01		1.9E+01	2.2E+01	9.18E+00	pCi/g	57.03%	RICHRC5010
PU239/40	1.18E+03		8.4E+01	2.3E+02	6.76E+00	pCi/g	57.03%	RICHRC5010

Number of Results: 5

## SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: 9D1RW010 MATRIX: OTHER  
CLIENT ID: B0W515 DATE RECEIVED: 8/26/99 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
CO-60	6.19E-02	U	8.2E-02	8.2E-02	1.53E-01	pCi/g		RICHRC5017
CS-137	8.67E-02	U	8.5E-02	8.5E-02	1.35E-01	pCi/g		RICHRC5017
EU-152	-5.47E-02	U	2.1E-01	2.1E-01	3.47E-01	pCi/g		RICHRC5017
EU-154	-2.52E-02	U	2.3E-01	2.3E-01	4.00E-01	pCi/g		RICHRC5017
EU-155	1.56E-01	U	1.8E-01	1.8E-01	3.18E-01	pCi/g		RICHRC5017
ALPHA	2.47E+01		4.2E+00	6.4E+00	1.49E+00	pCi/g	100.00%	RICHRC5014
BETA	1.13E+01	J	2.1E+00	2.5E+00	2.87E+00	pCi/g	100.00%	RICHRC5014

Number of Results:



## SAMPLE RESULTS

LAB NAME:	QUANTERRA, Richland	SDG: /RPT GRP:	W02883 / 9153
LAB SAMPLE ID:	9D1RW310	MATRIX:	OTHER
CLIENT ID:	B0W516	DATE RECEIVED:	8/26/99 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
AM-241	6.19E-01	J	1.1E-01	1.5E-01	2.42E-02	pCi/g	86.37%	RICHRC5008
CM-242	-4.25E-04	U	8.5E-04	8.5E-04	2.14E-02	pCi/g	86.37%	RICHRC5008
CM-244	0.00E+00	U	0.0E+00	1.1E-02	1.23E-02	pCi/g	86.37%	RICHRC5008
PU-238	1.23E-01	J	6.0E-02	6.4E-02	1.96E-02	pCi/g	45.01%	RICHRC5010
PU239/40	2.99E+00		2.9E-01	6.2E-01	1.96E-02	pCi/g	45.01%	RICHRC5010
NP-237	0.00E+00	U	0.0E+00	1.0E-02	1.13E-02	pCi/g	100.00%	RICHRC5009
CO-60	1.53E-01	U	1.2E-01	1.2E-01	2.38E-01	pCi/g		RICHRC5017
CS-137	2.32E-01	U	1.2E-01	1.2E-01	2.31E-01	pCi/g		RICHRC5017
EU-152	-5.76E-02	U	2.7E-01	2.7E-01	4.63E-01	pCi/g		RICHRC5017
EU-154	1.50E-01	U	3.6E-01	3.6E-01	6.56E-01	pCi/g		RICHRC5017
EU-155	1.80E-01	U	2.5E-01	2.5E-01	4.51E-01	pCi/g		RICHRC5017
ALPHA	3.56E+00	J	2.3E+00	2.4E+00	3.29E+00	pCi/g	100.00%	RICHRC5014
BETA	1.41E+00	U	1.9E+00	1.9E+00	3.91E+00	pCi/g	100.00%	RICHRC5014

Number of Results: 13

## SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: 9D1RW810 MATRIX: OTHER  
CLIENT ID: B0W519 DATE RECEIVED: 8/26/99 3:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
CO-60	-3.40E-03	U	3.8E-02	3.8E-02	6.59E-02	pCi/g		RICHRC5017
CS-137	5.64E-01		9.5E-02	9.5E-02	6.00E-02	pCi/g		RICHRC5017
EU-152	3.37E-02	U	9.1E-02	9.1E-02	1.57E-01	pCi/g		RICHRC5017
EU-154	-6.12E-02	U	1.2E-01	1.2E-01	2.03E-01	pCi/g		RICHRC5017
EU-155	9.59E-02	U	8.4E-02	8.4E-02	1.49E-01	pCi/g		RICHRC5017
ALPHA	9.72E-01	U	1.0E+00	1.0E+00	1.74E+00	pCi/g	100.00%	RICHRC5014
BETA	9.85E+00	J	2.1E+00	2.5E+00	3.22E+00	pCi/g	100.00%	RICHRC5014

Number of Results: 7

## DUPLICATE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D1RVG17R MATRIX: OTHER  
CLIENT ID: B0W517 DUP DATE RECEIVED: 8/26/99 3:00:00 PM  
ORIG LAB SAMPLE ID: 9D1RVG10

ANALYTE	DUP RESULT	Q	COUNTING ERROR ( 2 s)	TOTAL ERROR ( 2 s)	MDA/ IDL	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
CO-60	4.67E-02	U	6.3E-02	6.3E-02	1.17E-01	pCi/g		RICHRC5017	2.67E-02	54.44%
CS-137	9.32E-02	U	6.4E-02	6.4E-02	1.18E-01	pCi/g		RICHRC5017	2.62E-01	95.10%
EU-152	-2.77E-02	U	1.5E-01	1.5E-01	2.47E-01	pCi/g		RICHRC5017	-1.24E-01	126.83%
EU-154	3.77E-02	U	1.9E-01	1.9E-01	3.29E-01	pCi/g		RICHRC5017	-3.42E-02	4119.79%
EU-155	-1.39E-02	U	1.3E-01	1.3E-01	2.07E-01	pCi/g		RICHRC5017	1.53E-02	4062.31%

Number of Results:

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL.

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## DUPLICATE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D1RVV17R MATRIX: OTHER  
CLIENT ID: B0W518 DUP DATE RECEIVED: 8/26/99 3:00:00 PM  
ORIG LAB SAMPLE ID: 9D1RVV10

ANALYTE	DUP RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
NP-237	1.49E+00		1.5E-01	3.8E-01	1.99E-02	pCi/g	100.00%	RICHRC5009	1.98E+00	28.01%

Number of Results:

## DUPLICATE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D1RW014R MATRIX: OTHER  
CLIENT ID: B0W515 DUP DATE RECEIVED: 8/26/99 3:00:00 PM  
ORIG LAB SAMPLE ID: 9D1RW010

ANALYTE	DUP RESULT	Q	COUNTING ERROR ( 2 s)	TOTAL ERROR ( 2 s)	MDA/ IDL	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
BETA	6.03E+00	J	1.7E+00	1.9E+00	2.83E+00	pCi/g	100.00%	RICHRC5014	1.13E+01	61.00%

Number of Results:

### DUPLICATE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D1RW317R MATRIX: OTHER  
CLIENT ID: B0W516 DUP DATE RECEIVED: 8/26/99 3:00:00 PM  
ORIG LAB SAMPLE ID: 9D1RW310

ANALYTE	DUP RESULT	Q	COUNTING ERROR ( 2 s)	TOTAL ERROR ( 2 s)	MDA/ IDL	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
AM-241	6.71E-01	J	1.1E-01	1.6E-01	2.24E-02	pCi/g	92.60%	RICHRC5008	6.19E-01	8.16%
CM-242	5.25E-03	U	1.1E-02	1.1E-02	1.42E-02	pCi/g	92.60%	RICHRC5008	-4.25E-04	235.17%
CM-244	-3.60E-04	U	7.2E-04	7.2E-04	1.81E-02	pCi/g	92.60%	RICHRC5008	0.00E+00	200.00%

Number of Results:

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL.

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rptChemRadDup; v3.41

0015

**DUPLICATE RESULTS**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D1RW318R MATRIX: OTHER  
CLIENT ID: B0W516 DUP DATE RECEIVED: 8/26/99 3:00:00 PM  
ORIG LAB SAMPLE ID: 9D1RW310

ANALYTE	DUP RESULT	Q	COUNTING ERROR ( 2 s)	TOTAL ERROR ( 2 s)	MDA/ IDL	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
PU-238	9.18E-02	J	4.9E-02	5.2E-02	2.65E-02	pCi/g	51.61%	RICHRC5010	1.23E-01	29.04%
PU239/40	2.47E+00		2.6E-01	5.1E-01	1.78E-02	pCi/g	51.61%	RICHRC5010	2.99E+00	19.10%

Number of Results:

## DUPLICATE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D1RW814R MATRIX: OTHER  
CLIENT ID: B0W519 DUP DATE RECEIVED: 8/26/99 3:00:00 PM  
ORIG LAB SAMPLE ID: 9D1RW810

ANALYTE	DUP RESULT	COUNTING Q ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
ALPHA	3.11E+00 J	1.8E+00	1.9E+00	2.32E+00	pCi/g	100.00%	RICHRC5014	9.72E-01	104.74%

Number of Results:



## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FVE11B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
CO-60	3.01E-03	U	4.5E-02	4.5E-02	8.13E-02	pCi/g		RICHRC5017
CS-137	2.07E-03	U	4.6E-02	4.6E-02	8.02E-02	pCi/g		RICHRC5017
EU-152	-5.70E-02	U	1.2E-01	1.2E-01	1.77E-01	pCi/g		RICHRC5017
EU-154	7.26E-02	U	1.3E-01	1.3E-01	2.40E-01	pCi/g		RICHRC5017
EU-155	1.77E-02	U	9.7E-02	9.7E-02	1.70E-01	pCi/g		RICHRC5017

Number of Results: 5

## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FVE13B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
CO-60	-4.74E-03	U	1.3E-02	1.3E-02	2.27E-02	pCi/g		RICHRC5017
CS-137	2.00E-03	U	1.3E-02	1.3E-02	2.23E-02	pCi/g		RICHRC5017
EU-152	8.86E-03	U	3.2E-02	3.2E-02	5.52E-02	pCi/g		RICHRC5017
EU-154	1.27E-02	U	4.1E-02	4.1E-02	7.27E-02	pCi/g		RICHRC5017
EU-155	-3.53E-03	U	2.6E-02	2.6E-02	4.50E-02	pCi/g		RICHRC5017

Number of Results:

## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FVK11B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
NP-237	0.00E+00	U	0.0E+00	1.0E-02	1.13E-02	pCi/g	100.00%	RICHRC5009

Number of Results:

## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FW213B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
AM-241	6.78E-01	J	1.1E-01	1.6E-01	1.15E-02	pCi/g	93.65%	RICHRC5008
CM-242	-7.26E-04	U	1.0E-03	1.0E-03	2.07E-02	pCi/g	93.65%	RICHRC5008
CM-244	0.00E+00	U	0.0E+00	1.0E-02	1.15E-02	pCi/g	93.65%	RICHRC5008

Number of Results: 3

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL

Quanterra Analytical Services, Inc  
rptChemRadBlank; v3.41

0021

## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FWA13B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
PU-238	1.14E-01	J	4.6E-02	5.0E-02	1.24E-02	pCi/g	71.04%	RICHRC5010
PU239/40	2.67E+00		2.2E-01	5.1E-01	1.24E-02	pCi/g	71.04%	RICHRC5010

Number of Results: 2

## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FWE11B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
BETA	-8.89E-02	U	2.2E-01	2.2E-01	5.10E-01	pCi/g	100.00%	RICHRC5014

Number of Results:

## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FWJ11B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
ALPHA	1.31E-02	U	3.4E-02	3.4E-02	7.27E-02	pCi/g	100.00%	RICHRC5014

Number of Results:

## BLANK RESULTS

LAB NAME: QUANTERRA, Richland SDG /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D39PP11B MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
PU-238	-2.12E-03	U	2.5E-03	2.5E-03	4.41E-02	pCi/g	46.92%	RICHRC5010
PU239/40	1.77E-02	U	2.5E-02	2.5E-02	2.40E-02	pCi/g	46.92%	RICHRC5010

Number of Results:



## LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FVE12S MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
CO-60	3.04E+00		3.6E-01	3.6E-01	9.15E-02	pCi/g		3.04E+00	99.77%
CS-137	1.99E+00		2.7E-01	2.7E-01	1.14E-01	pCi/g		1.98E+00	100.60%
EU-152	5.48E+00		6.4E-01	6.4E-01	2.65E-01	pCi/g		6.10E+00	89.78%

Number of Results:

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL.

Quanterra Analytical Services, Inc  
rptChemRadLcs; v3.41

0026

**LABORATORY CONTROL SAMPLE**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FVK12S MATRIX: OTHER

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ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
NP-237	7.51E-01	J	1.1E-01	2.1E-01	1.94E-02	pCi/g	100.00%	9.08E-01	82.71%

---

Number of Results:

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Result = IDL When Not Detecte

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL.

Quanterra Analytical Services, Inc  
rptChemRadLcs; v3.41

0027

**LABORATORY CONTROL SAMPLE**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FW214S MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
AM-241	2.25E+00		2.0E-01	4.3E-01	1.78E-02	pCi/g	94.51%	2.28E+00	98.90%

Number of Results:

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL.

Quanterra Analytical Services, Inc  
rptChemRadLcs; v3.41

0028

## LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FWA14S MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
PU239/40	2.37E+00		2.2E-01	4.7E-01	1.40E-02	pCi/g	65.96%	2.28E+00	103.87%

Number of Results:

## LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FWE12S MATRIX: OTHER

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
BETA	1.39E+01	J	8.0E-01	2.0E+00	4.95E-01	pCi/g	100.00%	1.37E+01	101.80%

Number of Results: 1

**LABORATORY CONTROL SAMPLE**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D2FWJ12S MATRIX: OTHER

---

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
ALPHA	4.27E+00	J	3.1E-01	9.3E-01	5.97E-02	pCi/g	100.00%	4.54E+00	94.08%

---

Number of Results:

---

Result = IDL When Not Detected

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL.

Quanterra Analytical Services, Inc  
rptChemRadLcs; v3.41

0031

**LABORATORY CONTROL SAMPLE**

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D39PP12S MATRIX: OTHER

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ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/ IDL	REPORT UNIT	YIELD	EXPECTED	RECOVERY
PU239/40	2.70E+00		2.9E-01	5.8E-01	3.80E-02	pCi/g	44.14%	2.26E+00	119.30%

---

Number of Results:

## MATRIX SPIKE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02883 / 9153  
LAB SAMPLE ID: D1RW319W MATRIX: OTHER

ANALYTE	SPIKE RESULT*	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	SAMPLE RESULT	EXPECTED	RECOVERY
NP-237	1.97E-01	J	5.6E-02	7.3E-02	1.98E-02	pCi/g	0.00E+00	9.03E-01	21.87%

Number of Results: 1

\*Spike Result Corrected For Sample Result

Result = IDL When Not Detecte

(Q)ualifiers: U = Analyte result < MDA/IDL,  
J = No U qualifier and result < RDL.

Quanterra Analytical Services, Inc  
rptChemRadMatrixSpike; v3.41

0033



Data Review Checklist  
RADIOCHEMISTRY

Lot Number: <u>594270144</u>				
Client ID: <u>2010/29/99-PLG-BHI</u>				
Due Date: <u>9/16/99</u>				
QC Batch Number: <u>9858209</u>		SDG Number: <u>2883</u>		
Method Test Parameter: <u>SV-AM</u>				
Matrix: <u>other</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	✓
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	✓	NEW ✓		
2. Were all sample holding times met?	✓			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓			
C. QC Samples				
1. Is the blank yield within acceptance criteria?	✓			
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			
3. Does the blank result meet the Contract criteria?	✓			
4. Is the blank result < the Contract Detection Limit?	✓			
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			
7. Is the LCS yield within acceptance criteria?	✓			
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			
9. Do the MS/MSD results and yields meet acceptance criteria?			✓	
10. Do the duplicate sample results and yields meet acceptance criteria?	✓			
D. Other				
1. Are all Nonconformances included and noted?				
2. Are all required forms filled out?	✓			
3. Was the correct methodology used?	✓			
4. Was transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Were units checked?	✓			✓

Comments on any "No" response: DIRVU needs reanalysis at much lower signal

First Level Review: Pam K. Smith Date: 10-4-99  
Second Level Review: Jackie Waddell Date: 10/29/99

LS-038, Rev.5, 4/99

0034

Data Review Checklist  
RADIOCHEMISTRY

Lot Number: <u>J9H270144</u>				
Client ID: <u>2010/29/99-BHI</u>				
Due Date: <u>9/16/99</u>				
QC Batch Number: <u>9278435</u>		SDG Number: <u>2883</u>		
Method Test Parameter: <u>SX-AM</u>				
Matrix: <u>2010/29/99-BHI other</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	✓
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	✓			
2. Were all sample holding times met?	✓			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓			
C. QC Samples				
1. Is the blank yield within acceptance criteria?	✓			
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			
3. Does the blank result meet the Contract criteria?	✓			
4. Is the blank result < the Contract Detection Limit?	✓			
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			
7. Is the LCS yield within acceptance criteria?	✓			
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			
9. Do the MS/MSD results and yields meet acceptance criteria?			✓	
10. Do the duplicate sample results and yields meet acceptance criteria?			✓	
D. Other				
1. Are all Nonconformances included and noted?	✓			
2. Are all required forms filled out?	✓			
3. Was the correct methodology used?	✓			
4. Was transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Were units checked?	✓			✓

Comments on any "No" response: re-extraction ok result > MDA x RDC J00679

First Level Review: Pam Kenney

Date: 10-28-99

Second Level Review: Jackie Waddell

Date: 10/29/99



# Nonconformance Memo

NCM #: <b>J00679</b>	Classification: <b>Anomaly</b>
NCM Initiated By: Pam Kenitzer	Status: <b>CLOSED</b>
Date Opened: 10/29/99	Production Area: Environmental - Sep
Date Closed: 11/16/99	Tests: Amlso by ALP
	Lot #'s (Sample #'s): J9H270144 (2)
	QC Batch: 9278435

Nonconformance: Other (describe in detail)  
Subcategory: Other (explanation required)

## Problem Description / Root Cause

<u>Name</u>	<u>Date</u>	<u>Description</u>
Pam Kenitzer	10/29/99	Sample results were so high the tracer was masked. Sample reextracted at a lower aliquot. Data accepted.

## Corrective Action

<u>Name</u>	<u>Date</u>	<u>Corrective Action</u>
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## Quality Assurance Verification

<u>Verified By</u>	<u>Due Date</u>	<u>Status</u>	<u>Notes:</u>
Jodie Carnes	N/A	Verified/completed	

## Client Notification Summary

<u>Client</u>	<u>Project Manager</u>	<u>Date Notified</u>	<u>Response Date</u>	<u>How Notified</u>
BECHTEL HANFORD, INC.	Doug Swenson	11/01/99	11/01/99	by narrative
	<u>Response</u>	<u>Response Details</u>		
	No response saved			

## Approval History

<u>Name</u>	<u>Date Approved:</u>	<u>Position</u>
Pam Kenitzer	10/29/99	Group Leader
Dale OConnell	10/29/99	Group Leader
Jackie Waddell	11/01/99	Project Manager
Jodie Carnes	11/16/99	Quality Assurance

**Data Review Checklist  
RADIOCHEMISTRY**

Lot Number: <u>594270144</u>				
Client ID: <u>PBW</u>				
Due Date: <u>9/16/99</u>				
QC Batch Number: <u>9258207</u>		SDG Number: <u>2883</u>		
Method Test Parameter: <u>SW-NP</u>				
Matrix: <u>Other</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
<b>A. Calibration</b>				
1. Is the calibration documentation included where applicable?			/	/
<b>B. Sample Analysis</b>				
1. Are the sample yields within acceptance criteria?	/			
2. Were all sample holding times met?	/			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	/			
<b>C. QC Samples</b>				
1. Is the blank yield within acceptance criteria?	/			
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	/			
3. Does the blank result meet the Contract criteria?	/			
4. Is the blank result < the Contract Detection Limit?	/			
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			/	
6. Is the LCS result within acceptance criteria?	/			
7. Is the LCS yield within acceptance criteria?	/			
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	/			
9. Do the MS/MSD results and yields meet acceptance criteria?		/		
10. Do the duplicate sample results and yields meet acceptance criteria?	/			
<b>D. Other</b>				
1. Are all Nonconformances included and noted? <u>1 NCM</u>	/			✓
2. Are all required forms filled out?	/			
3. Was the correct methodology used?	/			
4. Was transcription checked?	/			
5. Were all calculations checked at a minimum frequency?	/			
6. Were units checked?	/			

Comments on any "No" response: MS out of limits. Data accepted (matrix effect). NCM # 500553

Accept w/MS due to matrix (Jressner 10/21/99)

First Level Review: Jessie Conillera  
 Second Level Review: Devin Waddell

Date: 10/21/99  
 Date: 10/21/99

# Nonconformance Memo

NCM #: **J00553**  
NCM Initiated By: **Tabitha Liebrecht**  
Date Opened: **09/29/99**  
Date Closed: **11/16/99**

Classification: **Anomaly**  
Status: **CLOSED**  
Production Area: **Reporting**  
Tests: **Np-237 by ALP**  
Lot #'s (Sample #'s): **J9H270144 (4)**  
QC Batch: **None.**

Nonconformance: **LCS result out of limits**  
Subcategory: **Matrix effect**

## Problem Description / Root Cause

Name	Date	Description
Tabitha Liebrecht	09/29/99	Matrix of insulation and metal coupons. Matrix spike yield out of limits.

## Corrective Action

Name	Date	Corrective Action
Tabitha Liebrecht	09/29/99	Data accepted.

## Quality Assurance Verification

Verified By	Due Date	Status	Notes:
Jodie Carnes	N/A	Verified/completed	

## Client Notification Summary

Client	Project Manager	Date Notified	Response Date	How Notified
BECHTEL HANFORD, INC.	Doug Swenson	10/22/99	10/22/99	by narrative
	<u>Response</u>	<u>Response Details</u>		
	No response saved			

## Approval History

Name	Date Approved:	Position
Tabitha Liebrecht	09/29/99	Group Leader
Jodie Carnes	11/16/99	Quality Assurance

**Data Review Checklist  
RADIOCHEMISTRY**

Lot Number: <u>79H270/144</u>				
Client ID: <u>W10/28/99 - F60 BHI</u>				
Due Date: <u>9/16/99</u>				
QC Batch Number: <u>9978439</u>		SDG Number: <u>2883</u>		
Method Test Parameter: <u>SO-RUSO</u>				
Matrix: <u>Other</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
<b>A. Calibration</b>				
1. Is the calibration documentation included where applicable?			✓	✓
<b>B. Sample Analysis</b>				
1. Are the sample yields within acceptance criteria?	✓			
2. Were all sample holding times met?	✓			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓			
<b>C. QC Samples</b>				
1. Is the blank yield within acceptance criteria?	✓			
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			
3. Does the blank result meet the Contract criteria?	✓			
4. Is the blank result < the Contract Detection Limit?	✓			
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			
7. Is the LCS yield within acceptance criteria?	✓			
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			
9. Do the MS/MSD results and yields meet acceptance criteria?			✓	
10. Do the duplicate sample results and yields meet acceptance criteria?	✓			
<b>D. Other</b>				
1. Are all Nonconformances included and noted?	✓			
2. Are all required forms filled out?	✓			
3. Was the correct methodology used?	✓			
4. Was transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Were units checked?	✓			↓

Comments on any "No" response: reanalyzed because of contamination  
DIRV3 - none left to be analyzed NCM J00669

Will 13/99  
Report duplicate results from original analysis.  
Report DIRV201, DIRV6201 w/OC from this reanalysis

Report all  
 First Level Review: Pam Kenitz W10/28/99 Date: 10-27-99  
 Second Level Review: Jackie Waddell Date: 10/28/99

# **Quanterra** Nonconformance Memo

Clouseau

NCM #: **J00669**  
NCM Initiated By: Pam Kenitzer  
Date Opened: 10/28/99  
Date Closed: 11/13/99

Classification: **Anomaly**  
Status: **CLOSED**  
Production Area: Environmental - Sep  
Tests: Pulso by ALP  
Lot #'s (Sample #'s): J9H270144 (1,2)  
QC Batch: 9278439

Nonconformance: Blank result above Contract Limit  
Subcategory: Other (explanation required)

## Problem Description / Root Cause

<u>Name</u>	<u>Date</u>	<u>Description</u>
Pam Kenitzer	10/28/99	One sample in the batch was very high. The blank showed cross contamination. Samples were reextracted. There was no sample left for d1rw3 to reextract. Call it lost. Reextraction of the other sample at a smaller aliquot produces good results. Data accepted.
Jackie Waddell	11/13/99	The detected blank activity was the same as the spike level used, however, the duplicate sample results (D1RW3) were also detected at this level. The root cause is unknown. JW 11/13/99

## Corrective Action

<u>Name</u>	<u>Date</u>	<u>Corrective Action</u>
Pam Kenitzer	10/28/99	Data reextracted.
Jackie Waddell	11/13/99	The batch was reanalyzed with exception of sample D1RW3 which had insufficient volume remaining for reanalysis. On the reanalysis data, the duplicate results (D1RVG) for Pu-238 do not meet the RPD limit. The original analysis result for D1RVG confirms the activity for Pu-239 and matches one on the reanalysis results for Pu-238. With exception of D1RVV, both sets of data will be reported. JW 11/13/99

## Quality Assurance Verification

<u>Verified By</u>	<u>Due Date</u>	<u>Status</u>	<u>Notes:</u>
Jodie Carnes	N/A	Verified/completed	

## Client Notification Summary

<u>Client</u>	<u>Project Manager</u>	<u>Date Notified</u>	<u>Response Date</u>	<u>How Notified</u>
BECHTEL HANFORD, INC.	Doug Swenson	11/13/99	11/13/99	by narrative
	<u>Response</u>	<u>Response Details</u>		
	No response saved			

NCM #: **J00669**  
NCM Initiated By: Pam Kenitzer  
Date Opened: 10/28/99  
Date Closed: 11/13/99

Classification: **Anomaly**  
Status: **CLOSED**  
Production Area: Environmental - Sep  
Tests: Pulso by ALP  
Lot #'s (Sample #'s): J9H270144 (1,2)  
QC Batch: 9278439

Nonconformance: Blank result above Contract Limit  
Subcategory: Other (explanation required)

### Approval History

<u>Name</u>	<u>Date Approved:</u>	<u>Position</u>
Pam Kenitzer	10/28/99	Group Leader
Dale OConnell	10/29/99	Group Leader
Jodie Carnes	11/13/99	Quality Assurance



**Data Review Checklist  
RADIOCHEMISTRY**

Lot Number: <u>3914270144</u>				
Client ID: <u>BHL</u>				
Due Date: <u>9/16/99</u>				
QC Batch Number: <u>9258215</u>		SDG Number: <u>2883</u>		
Method Test Parameter: <u>SD-Pu-250</u>				
Matrix: <u>Other</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
<b>A. Calibration</b>				
1. Is the calibration documentation included where applicable?			✓	✓
<b>B. Sample Analysis</b>				
1. Are the sample yields within acceptance criteria?	✓	✓		
2. Were all sample holding times met?	✓			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓			
<b>C. QC Samples</b>				
1. Is the blank yield within acceptance criteria?	✓			
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?		✓		
3. Does the blank result meet the Contract criteria?		✓		
4. Is the blank result < the Contract Detection Limit?		✓		
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?	4	PK 12-4-00	✓	
6. Is the LCS result within acceptance criteria?	✓			
7. Is the LCS yield within acceptance criteria?	✓			
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			
9. Do the MS/MSD results and yields meet acceptance criteria?			✓	
10. Do the duplicate sample results and yields meet acceptance criteria?	✓			
<b>D. Other</b>				
1. Are all Nonconformances included and noted?				
2. Are all required forms filled out?	✓			
3. Was the correct methodology used?	✓			
4. Was transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Were units checked?	✓			✓

Comments on any "No" response: DIRVV so high - needs re extraction -  
Blank contaminated batch needs reanalysis.

Spike added to blank sample  
W 10/28/99

Rept all  
but DIRVV  
will be

First Level Review: PK Smith

Date: 10-4-99

Second Level Review: Jackie Waddell

Date: 10/28/99

Report - DIRW3 + dup w/025  
11/13/99  
use reanalysis batch for other smpls.

0042

# Data Review Checklist RADIOCHEMISTRY

Lot Number: J94270144				
Client ID: 127642				
Due Date: 9-16-99				
QC Batch Number: 9258205		SDG Number: 2883		
Method Test Parameter: Gamma				
Matrix: OTHER: Insulation / Coupons				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	✓
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			✓	
2. Were all sample holding times met?			✓	
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓	✓		
C. QC Samples				
1. Is the blank yield within acceptance criteria?			✓	
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓	✓		
3. Does the blank result meet the Contract criteria?	✓			
4. Is the blank result < the Contract Detection Limit?	✓			
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			
7. Is the LCS yield within acceptance criteria?			✓	
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓	✓		
9. Do the MS/MSD results and yields meet acceptance criteria?			✓	
10. Do the duplicate sample results and yields meet acceptance criteria?	✓			
D. Other				
1. Are all Nonconformances included and noted? TOO SO5	✓			
2. Are all required forms filled out?	✓			
3. Was the correct methodology used?	✓			
4. Was transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Were units checked?	✓			✓

Comments on any "No" response:

MDAs not met due to matrices  
Data accepted  
JN 11/10/99

First Level Review:

*[Signature]*

Date: 9-20-99

Second Level Review:

*[Signature: Jackie Waddell]*

Date: 11/10/99

# Data Review Checklist RADIOCHEMISTRY

Lot Number: <u>394270144</u>				
Client ID: <u>PGW</u>				
Due Date: <u>9/16/99</u>				
QC Batch Number: <u>9258218</u>		SDG Number: <u>2883</u>		
Method Test Parameter: <u>ST-alpha</u>				
Matrix: <u>Other</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	✓
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			✓	
2. Were all sample holding times met?	✓			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓			
C. QC Samples				
1. Is the blank yield within acceptance criteria?			✓	
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			
3. Does the blank result meet the Contract criteria?	✓			
4. Is the blank result < the Contract Detection Limit?	✓			
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			
7. Is the LCS yield within acceptance criteria?			✓	
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			
9. Do the MS/MSD results and yields meet acceptance criteria?			✓	
10. Do the duplicate sample results and yields meet acceptance criteria?	✓			
D. Other				
1. Are all Nonconformances included and noted?			✓	
2. Are all required forms filled out?	✓			
3. Was the correct methodology used?	✓			
4. Was transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Were units checked?	✓			✓

Comments on any "No" response: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

First Level Review: Pam Kanitz Date: 9-28-99

Second Level Review: Jackie Waddell Date: 11/10/99

# Data Review Checklist RADIOCHEMISTRY

Lot Number: <u>591422044</u>				
Client ID: <u>PLW</u>				
Due Date: <u>9/16/99</u>				
QC Batch Number: <u>9258217</u>		SDG Number: <u>2883</u>		
Method Test Parameter: <u>58-Beta</u>				
Matrix: <u>Biologic</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2 <sup>nd</sup> Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	✓
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			✓	
2. Were all sample holding times met?	✓			
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓			
C. QC Samples				
1. Is the blank yield within acceptance criteria?			✓	
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			
3. Does the blank result meet the Contract criteria?	✓			
4. Is the blank result < the Contract Detection Limit?	✓			
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			
7. Is the LCS yield within acceptance criteria?			✓	
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			
9. Do the MS/MSD results and yields meet acceptance criteria?			✓	
10. Do the duplicate sample results and yields meet acceptance criteria?	✓			
D. Other				
1. Are all Nonconformances included and noted?			✓	
2. Are all required forms filled out?	✓			
3. Was the correct methodology used?	✓			
4. Was transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Were units checked?	✓			✓

Comments on any "No" response: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

First Level Review: Paul K. Smith Date: 9-28-99

Second Level Review: Jackie Waddell Date: 11/10/99

## CHAIN OF CUSTODY

<b>Bechtel Hanford Inc.</b>		<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>					<b>B99-024-10</b>		Page <u>1</u> of <u>1</u>												
Collector Fahlberg		Company Contact Dave Encke		Telephone No. 373-3461		Project Coordinator TRENT, SJ		Price Code <b>IV/FE</b> Data Turnaround <b>21 Days</b>													
Project Designation 233-S Plutonium Concentration Facility Process Areas - Ot		Sampling Location 233-S 200 west		SAF No. B99-024																	
Ice Chest No. <b>ERC 99-010</b>		Field Logbook No. EFL 1133-7		Method of Shipment Gov vehicle																	
Shipped To Quanterra Incorporated		Offsite Property No.		Bill of Lading/Air Bill No.																	
<b>Q-27038</b>				COA																	
POSSIBLE SAMPLE HAZARDS/REMARKS    Special Handling and/or Storage				Preservation		None	<b>None</b>														
				Type of Container		aG	<b>P</b>														
				No. of Container(s)		1	<b>1</b>														
				Volume		500mL	<b>20g</b>														
<b>SIX</b> <b>WD2883</b> <div style="text-align: center;">SAMPLE ANALYSIS</div> <b>Due 9-17</b> <b>J9H270144</b>				See item (1) in Special Instructions.		<b>See #2</b>															
Sample No.		Matrix *	Sample Date	Sample Time																	
BOW517		Other Solid	8-19-99	1410	X		DI RVG					Bow 522									
BOW518		Other Solid	8-19-99	1410		X	DI RVV					Bow 523									
Bow 515		Other Solid	8-24-99	0945	X		DI RWO					Bow 524									
Bow 516		Other Solid	8-24-99	0945		X	DI RW3					Bow 525									
Bow 519		Other Solid	8-24-99	0800	X		DI RW8					Bow 526									
CHAIN OF POSSESSION		Sign/Print Names				<b>SPECIAL INSTRUCTIONS</b> (1) Gamma Spectroscopy (Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155) and Gross Alpha/Gross Beta 2) Gamma Spec. (et. al.) and Gross Alpha/Beta, Isotopes Pu, Isotopic Am., Cm, R NPB3? <b>RE 8-23-99</b>						Matrix * Soil Water Vapor Other Solid Other Liquid									
														Relinquished By		Date/Time		Received By		Date/Time	
														Relinquished By		Date/Time		Received By		Date/Time	
														Relinquished By		Date/Time		Received By		Date/Time	
														Relinquished By		Date/Time		Received By		Date/Time	
LABORATORY SECTION		Received By				Title				Date/Time											
FINAL SAMPLE DISPOSITION		Disposal Method				Disposed By				Date/Time											

0047

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF6378

Sample Date &amp; Time 8/19/99 1410

Project ID: 233S RadCon

SAF Number: B99-024

Date Analyzed 8/24/99 3:19:5

Sample ID: BOW522

BOW517 Insulation

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	< 1.9E+02		1.9E+02
Co-60	< 2.3E+01		2.3E+01
Cs-137	< 2.6E+01		2.6E+01
Eu-152	< 6.2E+01		6.2E+01
Eu-154	< 8.2E+01		8.2E+01
Eu-155	< 7.5E+01		7.5E+01
Th-232D	< 6.7E+01		6.7E+01
Th-234	< 3.2E+02		3.2E+02
U-235	< 1.6E+02		1.6E+02
U-238D	< 5.1E+01		5.1E+01
U-238	< 3.5E+03		3.5E+03
Am-241	< 4.5E+01		4.5E+01

$12 \times 62.9 = 755 \text{ pCi/g}$   
 $21 \times 62.9 = 1321 \text{ pCi/g}$   
 $\alpha$   
 $\beta$   
Cat I  
B 8/30/99  
62.9 gm

Total GEA (pCi/g)

+/-

	Activity (pCi/g)		Error (pCi/g)
Gross Alpha**	1.2E+01	+/-	3.3E+00
Gross Beta	2.1E+01	+/-	4.2E+00

Alpha MDC (pCi/g)
5.1E+00
Beta MDC (pCi/g)
1.3E+01

## Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. &lt;MDC = Less than detection limit.

All GEA results reported as "&lt;" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the &gt; MDC GEA values in the second significant digit.

## For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuramics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst



T. J. Snider

8/25/99

Report To

Dave Encke

Dave St John

Fax

373-6562

372-9487

Report Printed: Wednesday, August 25, 1999

0048

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF6379Sample Date & Time 8/19/99 1410Project ID: 233S RadConSAF Number: B99-024Date Analyzed 8/24/99 2:16:3Sample ID: BOW523BOW 518 Calpan

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	< 3.2E+00		3.2E+00
Co-60	< 3.5E-01		3.5E-01
Cs-137	< 3.7E-01		3.7E-01
Eu-152	< 8.6E-01		8.6E-01
Eu-154	< 1.4E+00		1.4E+00
Eu-155	1.2E+00	+/- 5.8E-01	8.8E-01
Th-232D	< 9.8E-01		9.8E-01
Th-234	< 4.1E+00		4.1E+00
U-235	< 2.1E+00		2.1E+00
U-238	< 5.1E+01		5.1E+01
Am-241	8.5E+02	+/- 5.3E+01	4.0E+00

$10 \times 15.7 = 157$  pCi/g  
 $21 \times 15.7 = 330$   
Cat I  
8/30/99  
15.7 gm  
45.7 gm

Total GEA (pCi/g)	8.5E+02	+/-	5.4E+01
-------------------	---------	-----	---------

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	1.0E+01	+/- 3.7E-01
Gross Beta	2.1E+00	+/- 3.7E-01

Alpha MDC (pCi/g)
4.0E+00
Beta MDC (pCi/g)
1.4E+00

## Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. &lt;MDC = Less than detection limit.

All GEA results reported as "&lt;" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the &gt; MDC GEA values in the second significant digit.

## For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Po-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst

  
T. J. Snider

8/25/99

Report To

Dave Encke

Dave St John

Fax

373-6562

372-9487

Report Printed: Wednesday, August 25, 1999

0049



# ERC Radiological Counting Facility Analysis Report

RCF Number RCF6380

Sample Date & Time 8/24/99 0945

Project ID: 233S RadCon

SAF Number: B99-024

Date Analyzed 8/25/99 3:10:5

Sample ID: B0W524

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	< 6.7E+01		6.7E+01
Co-60	< 8.1E+00		8.1E+00
Cs-137	< 7.4E+00		7.4E+00
Eu-152	< 1.8E+01		1.8E+01
Eu-154	< 2.9E+01		2.9E+01
Eu-155	< 1.9E+01		1.9E+01
Th-232D	< 2.0E+01		2.0E+01
Th-234	< 1.1E+02		1.1E+02
U-235	< 5.1E+01		5.1E+01
U-238D	< 2.1E+01		2.1E+01
U-238	< 1.0E+03		1.0E+03
Am-241	< 1.3E+01		1.3E+01

$12 \times 4517 = 548$  pCi/sec  
 $65 \times 4517 = 2971$   
Cat I  
8/30/99

45.7 gm  
~~2.0 gm~~  
~~3.8 gm~~

Total GEA (pCi/g) +/-

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	1.2E+01 +/-	1.8E+00
Gross Beta	6.5E+01 +/-	3.8E+00

Alpha MDC (pCi/g)
4.8E+00
Beta MDC (pCi/g)
3.6E+01

## Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. <MDC = Less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

## For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption.

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst

  
T. J. Smider

8/26/99

Report To

Dave Encke

Dave St John

Fax

373-6562

372-9487

Report Printed: Thursday, August 26, 1999

0050

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF6381

Sample Data & Time 8/24/99 0945

Project ID: 233S RadCon

SAF Number: B99-024

Date Analyzed 8/25/99 2:09:2

Sample ID: B0W525

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	< 8.7E+01		8.7E+01
Co-60	< 8.2E+00		8.2E+00
Cs-137	< 7.7E+00		7.7E+00
Eu-152	< 2.3E+01		2.3E+01
Eu-154	< 2.7E+01		2.7E+01
Eu-155	< 1.9E+01		1.9E+01
Th-232D	< 2.0E+01		2.0E+01
Th-234	< 1.2E+02		1.2E+02
U-235	< 3.7E+01		3.7E+01
U-238D	< 1.5E+01		1.5E+01
U-238	< 1.4E+03		1.4E+03
Am-241	< 1.8E+01		1.8E+01

$390 \times 45.7 = 17823$  pCi/sw  
 $340 \times 45.7 = 15538$   
Cat II  
8/30/99

45.7

Total GEA (pCi/g) +/-

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 3.9E+02	
Gross Beta	< 3.4E+02	

Alpha MDC (pCi/g)
3.9E+02
Beta MDC (pCi/g)
3.4E+02

## Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested, <MDC = Less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

## For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

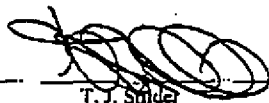
Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst

  
T. J. Smider

8/26/99

Report To

Dave Encke

Dave St John

Fax

373-6562

372-9487

Report Printed: Thursday, August 26, 1999

0051

# ERC Radiological Counting Facility Analysis Report

RCF Number RCF6382

Sample Date & Time 8/24/99 0800

Project ID: 233S RadCon

SAF Number: B99-024

Date Analyzed 8/26/99 7:27:4

Sample ID: B0W526

## Gamma Energy Analysis

Nuclide	Activity (pCi/g)	Error (pCi/g)	MDC (pCi/g)
K-40	8.1E+01	+/- 7.5E+01	6.9E+01
Co-60	< 1.3E+01		1.3E+01
Cs-137	< 1.0E+01		1.0E+01
Eu-152	< 2.5E+01		2.5E+01
Eu-154	< 2.2E+01		2.2E+01
Eu-155	< 2.4E+01		2.4E+01
Th-232D	< 2.8E+01		2.8E+01
Th-234	< 1.2E+02		1.2E+02
U-235	< 5.7E+01		5.7E+01
U-238	< 1.9E+03		1.9E+03
U-238D	< 2.0E+01		2.0E+01
Am-241	< 1.4E+01		1.4E+01

$0.19 \times 180 = 34$  pCi/sec  
 $12 \times 180 = 2160$   
Cat I  
180.0 gm  
8/30/99

Total GEA (pCi/g) 8.1E+01 +/- 7.5E+01

	Activity (pCi/g)	Error (pCi/g)
Gross Alpha**	< 1.9E+01	
Gross Beta	1.2E+01	+/- 1.8E+00

Alpha MDC (pCi/g)
1.9E+01
Beta MDC (pCi/g)
7.0E+00

## Definitions:

All errors reported at 2 standard deviations.

N/R = no result or analysis not requested. <MDC = Less than detection limit.

All GEA results reported as "<" list the Minimum Detectable Concentration (MDC) value for that radionuclide.

Rounding error may result in the reported total GEA activity differing from the sum of the > MDC GEA values in the second significant digit.

## For soils and natural samples, the following applies:

The analysis of U-238 is based on the activity of Pa-234m.

The analysis of Np-237 is based on the activity of Pa-233.

U-238dau is the activity of Pb-214 and Bi-214, short lived daughter products of U-238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th-232dau is the activity of Ac-228, Pb-212, and Tl-208, short lived daughter products of Th-232. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

\*\*The gross alpha results are not corrected for mass absorption

# No peaks for this radionuclide were visible above background in the spectrum. The result was reported as less than MDC.

Analyst

  
T. J. Snider

8/26/99

Report To

Dave Encke

Dave St John

Fax

373-6562

372-9487

Report Printed: Thursday, August 26, 1999

0052

Figure 1

### SAMPLE CHECK-IN LIST

Date/Time Received: 26 Aug 99 15:00 SG#: W02883

Work Order Number: J9H 270144 SAF #: B99-024

Shipping Container ID: ERC99-010 Chain of Custody #: B99-024-10

1. Custody Seals on shipping container intact? Yes ☒ No ☐
2. Custody Seals dated and signed? Yes ☒ No ☐
3. Chain-of-Custody record present? Yes ☒ No ☐
4. Cooler temperature N/A
5. Vermiculite/packing materials is Wet ☐ Dry ☒
6. Number of samples in shipping container: 5
7. Sample holding times exceeded? Yes ☐ No ☐

- |   |  |
|---|--|
| 8. Samples have:<br>____ tape<br>____ custody seals | ____ hazard labels<br>____ appropriate sample labels |
|---|--|

- |  |                                       |
|--|---------------------------------------|
| 9. Samples are:<br>____ in good condition<br>____ broken | ____ leaking<br>____ have air bubbles |
|--|---------------------------------------|

10. Where any anomalies identified in sample receipt? Yes ☐ No ☒
11. Description of anomalies (include sample numbers): \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Sample Custodian/Laboratory: Keith L. L. L. Date: 26 Aug 99 15:00

Telephoned To: \_\_\_\_\_ On \_\_\_\_\_ By \_\_\_\_\_

0053